If you are using a printed copy of this procedure, and not the on-screen version, then you MUST make sure the dates at the bottom of the printed copy and the on-screen version match.
The on-screen version of the Collider-Accelerator Department Procedure is the Official Version.
Hard copies of all signed, official, C-A Operating Procedures are kept on file in the C-A ESHQ Training Office, Bldg. 911A.

C-A OPERATIONS PROCEDURES MANUAL

5.21 Pre-Beam Instrumentation Checkout

Text Pages 2 through 8

Attachments

Hand Processed Changes

HPC No.	Date	Page Nos.	Initials

Approved: _____ _____
Collider-Accelerator Department Chairman Date

P. Sampson

5.21 Pre-Beam Instrumentation Checkout

1. Purpose

The purpose of this procedure is to provide MCR operators with instructions for checking out the instrumentation for the C-A complex.

2. Responsibilities

2.1 The MCR operators are responsible for executing this procedure when instructed to do so.

2.2 The Operations Coordinator (OC) is responsible for insuring the accurate execution of this procedure.

2.3 The OC shall initiate corrective actions to problems encountered during execution. These include:

2.3.1 Informing the appropriate systems specialist of problems.

2.3.2 Logging problems in the OC Log.

2.3.3 Editing the attachments when necessary to reflect any special situations or modifications.

2.3.4 Signing each attachment of this procedure when completed.

2.4 The MCR Group Leader (GL), or Deputy GL, may authorize the omission of sections of this procedure by marking them N/A on C-A-OPM-ATT 5.21.a.

3. Prerequisites

Systems specialists have handed all relevant systems over to the MCR as operational.

4. Precautions

MCR Operations will follow all applicable operational safety precautions while completing this procedure.

5. Procedure

5.1 Circulating beam and wall monitor checkout:

5.1.1 Connect the F15_IXFMR_NORM, F15_IXFMR_SLOW, A20_XFRMR_FAST and A20_XFRMR_SLOW signals to a scope and terminate to 1 MΩ.

5.1.2 Turn on the current transformer calibrate pulse.

5.1.3 Observe calibration pulse and indicate this on C-A-OPM-ATT 5.21.a

5.1.4 Have the instrumentation specialist check for correct normalization (correct generated revolution frequency). The revolution frequency is generated by the R.F. and sent to the current transformer hardware. Record the revolution frequency on C-A-OPM-ATT 5.21.a

5.1.5 Check the resistance of the C-A wall monitor with an ohm meter. It is located and labeled at MCR_3.

5.1.5.1 If the resistance is 50 ± 5Ω the wall monitor is considered okay.

5.1.5.2 Complete C-A-OPM-ATT 5.21.a.

5.2 AGS Ring Loss Monitor checkout.

Note:
For sections 5.2 and 5.3 of this procedure, the following is true:
This procedure is carried out in conjunction with an instrumentation group specialist. An instrumentation specialist will first use a Time Domain Reflectometer (TDR) to determine that all of the cabling is correct for the system. The operator will fill out C-A-OPM-ATT 5.21.b using information given by the specialist.

5.2.1 The MCR Operator will start the "AGS Loss Monitor" program and insure that only two (2) operating windows for the system, are defined. The first is to start at 0 and end at 500 ms from T0. The second starts at 500 and ends at 1500 ms from T0.

5.2.2 The Operator will set the gain to high and observe the noise signals. The instrumentation specialist will determine a threshold for good and bad channels. Bad channels shall be recorded on C-A-OPM-ATT 5.21.b.

5.2.3 Repeat 5.2.2 for low gain setting.

5.2.4 In each appropriate house in the AGS ring, the instrumentation specialist will check the bias on each channel. The MCR operator will check that a spike appears on the signal being tested using the 'AGS Loss Monitor' program (loss monitor gain in low). Bad channels shall be recorded on C-A-OPM-ATT 5.21.b.

5.2.5 To check the analog Multiplexer or MUX and timing, do the following:

5.2.5.1 Select four (4) channels from each house, one in each superperiod, and display their analog signals on an oscilloscope. The instrumentation specialist will then connect a 1 G ohm resistor to these channels.

5.2.5.2 Observe the analog signals. Note that each signal should appear as a 'sawtooth' trace. The positive slope should be approximately 2V/sec for both windows. The maximum and minimum voltage values for window 2 will be twice that of window 1, since the width of window 2 is also twice that of window 1.

5.2.5.3 Note any problems in C-A-OPM-ATT 5.21.b.

5.3 Booster Loss Monitor Checkout

5.3.1 Start the application 'Booster Loss Monitor'.

5.3.2 Set the timing as in 5.2.1 of this procedure.

5.3.3 Repeat steps 5.2.2-5.2.4 of this procedure for the Booster. The specialist will be in 930UEB for this test.

5.3.3.1 Observe the Fast Beam Inhibit (FBI) indicator lights in the LINAC Control Room (LCR) using the remote camera in the MCR and note when inhibits occur on C-A-OPM-ATT 5.21.c.

5.3.4 Insert each of the LINAC to Booster (LTB) harps and have the instrumentation specialist check that the loss monitor system reacts appropriately.

5.3.5 Repeat section 5.2.5 of this procedure for the Booster.

5.4 LINAC Loss Monitor and Fast Beam Inhibit (FBI) checkout.

Note:
This procedure is done in conjunction with a LINAC system specialist. The following describes actions taken by the MCR Operator.

At each of the LINAC Loss Monitors listed in C-A-OPM-ATT 5.21.c, a System Specialist will induce a `spike' signal:

5.4.1 Connect the signal being tested to a scope via `XBAR'.

5.4.2 Set the sweep speed to 10 ms/div.

5.4.2.1 If a pulse is observed, then check off the appropriate space in column 1 of C-A-OPM-ATT 5.21.c.

5.4.3 Using the camera at MCR_1 to observe the LINAC Control Room (LCR), check if the light on the HIGH RAD indicator in rack F2 is lit.

5.4.3.1 If the light is lit, then check off the appropriate space in C-A-OPM-ATT 5.21.c, column 2.

5.4.4 Start the program `Booster Loss Monitor'.

5.4.4.1 Observe each loss monitor as a signal is generated on it.

5.4.4.2 If counts are observed when a pulse is being generated, then check the appropriate space in column 3 of C-A-OPM-ATT 5.21.c.

5.5 SEB Instrumentation checkout.

Note:
Not all Segmented Wire Ion Chambers (SWICs) are used for every run. Note in the comments area of C-A-OPM-ATT 5.21.d if a SWIC is not being used.

Note:
An instrumentation specialist will generate a test pattern used to check each of the SWICs in the external beam lines. The following procedure describes steps to be carried out by the MCR Operator.

5.5.1 Connect each SWIC signal to a scope. The scope shall be set on internal trigger (either channel) with a 2 ms sweep rate.

5.5.1.1 Check that there is no more than 4 mV drift in each signal when no test signal is connected to it.

5.5.1.2 Check that the test signal is present when generated by the specialist (the shape of the signal will be described by the specialist).

5.5.1.2.1 If the signal satisfies [5.5.1.1] and [5.5.1.2], then it is considered okay.

5.5.1.2.2 Complete C-A-OPM-ATT 5.21.d.

5.6 Target temperature monitors and beam counters.

Note:
Secondary Emission Chambers (SECs) are used for proton runs, while ion chambers are used during heavy ion runs. An instrumentation specialist will generate a signal on the appropriate devices prior to a specific run.

5.6.1 When the specialist generates a signal on a device, observe the scaler output of that device.

5.6.1.1 If the output of the scaler is within tolerances given by the specialist, then check that the scaler is working properly in C-A-OPM-ATT 5.21.d.

5.6.1.2 If the scaler is not within the prescribed tolerances then check the appropriate box in column 2 of C-A-OPM-ATT 5.21.d and add comments in the comment line.

5.6.2 The Instrumentation Group shall provide calibrations for counters being used. A copy is to be attached to attachment of this procedure and another to be put in the SEB Instrumentation Book.

Note:
In the event of an improper reading, check the cable connection prior to listing a scaler as bad or out of calibration.

5.7 SEB Flag Checkout

5.7.1 Send all of the available flags to a command of ZERO (0).

5.7.1.1 Record the read back in column 1 of C-A-OPM-ATT 5.21.d.

5.7.2 Increment the flag until it is fully inserted (i.e. will not move in anymore).

5.7.2.1 Record the read back in column 2 of C-A-OPM-ATT 5.21.d.

5.7.3 Connect the flag to the video MUX and check that the picture is okay.

5.7.3.1 Indicate the state of the video for each flag in column 3 of C-A-OPM-ATT 5.21.d.

5.8 Movable Apertures Checkout

5.8.1 Send the STORE, or otherwise accepted value, to the devices listed in C-A-OPM-ATT 5.21.e.

5.8.1.1 Record the read back value for each device in column 1 of C-A-OPM-ATT 5.21.e.

5.8.1.2 Send the device to its maximum inserted position by incrementing the command until an in-limit indication is observed.

5.8.1.2.1 Record the read back of the insert limit in column 2 of C-A-OPM-ATT 5.21.e.

5.9 Booster and AGS Tune Meter Checkout.

5.9.1 Start the `AGS Tune Meter' and `Booster Tune Meter' applications.

5.9.1.1 Check off C-A-OPM-ATT 5.21.g in the appropriate column.

5.9.2 Turn each set of kickers on and fill out the related sections in C-A-OPM-ATT 5.21.g.

5.9.3 Connect the kicker signals to a scope and check that the output pulse is as expected.

5.9.3.1 The rise time shall be less than .5 and the width 1 to several µ seconds.

5.9.3.2 Fill out appropriate sections of C-A-OPM-ATT 5.21.g.

5.10 Transport Instrumentation

5.10.1 Start `Beam Line Instrument' and `spreadsheet'.

5.10.1.1 Check off the transformers that are working in C-A-OPM-ATT 5.21.h.

5.10.1.2 Note any problems in the comments area provided.

5.10.2 Check that the Beam Position Monitors (BPMs) are reading back.

5.10.2.1 Check off the BPMs that are working in C-A-OPM-ATT 5.21.h.

5.10.2.2 Note BPMs that are not working in the comments area.

5.10.3 Take a measurement with each of the available harps and insure that no errors are encountered.

5.10.3.1 Observe that the status for each harp on `SPREADSHEET' follows the sequence: 'out', 'mid', 'in', 'mid', 'out', during the measurement.

5.10.3.2 Check off the harps in C-A-OPM-ATT 5.21.h.

5.10.3.3 Comment on problems in the area provided.

6. Documentation

6.1 The attachments for this procedure will be held in a binder in the MCR and contains all of the completed work, as well as a list of problems encountered.

6.2 The OC will report progress made for each shift to the next shift by documentation in the OC Log.

7. References

7.1 C-A-OPM, Chapters 6 and 8.

8. Attachments

8.1 C-A-OPM-ATT 5.21.a, "Circulating Beam and Wall Monitor Checkout".

8.2 C-A-OPM-ATT 5.21.b, "AGS Ring Loss Monitor Checkout".

8.3 C-A-OPM-ATT 5.21.c, "LINAC Loss Monitor and FBI Checkout".

8.4 C-A-OPM-ATT 5.21.d, "SEB Instrumentation Checkout".

8.5 C-A-OPM-ATT 5.21.e, "Movable Apertures Checkout".

8.6 C-A-OPM-ATT 5.21.g, "Tune Meter Checkout".

8.7 C-A-OPM-ATT 5.21.h, "BTA/LTB Instrumentation Checkout".